Supplemental file 1: SOM training parameters and sensitivity analysis.

Table S1 shows the SOM parameters that were used in the main manuscript. These correspond to the default set of options of the SOM Toolbox.

Table S1: *Default SOM training parameters.*

SOM parameter	Option that was used
Normalization	Range scaling to a [-1 1] interval
Shape	2D sheet
Lattice	Hexagonal
Map size	Default option: 9 x 7
Initialization	Linear
Training algorithm	Batch training
Learning function	Reciprocally decreasing
Neighborhood function	Gaussian
Training length	
Rough training	5 iterations
Fine tuning	17 iterations
Neighborhood radius	
Rough training	2 (initial) → 1 (final)
Fine tuning	1 (initial) → 1 (final)

The three measures of SOM quality for this default set of options are given below (definitions from Kaski and Lagus 1996; Vesanto et al. 2000):

- Quantization error (QE): average Euclidean distance between normalized input vectors and their best-matching unit (after the training process): 0.651.
- Topographical error (TE): percentage of input vectors for which the best-matching unit and second best-matching units are not neighbours: 0.026 (i.e. 4 trials).
- Combined error (CE): average Euclidean distance between an input vector and their second best-matching unit, passing first through the best-matching unit and then through the shortest path of neighbouring units towards the second best-matching unit: 0.917.

A quality and sensitivity analysis of the SOM methodology was done to assess the robustness of the analysis performed in the main manuscript. We performed 1728 simulations on the dataset with different choices for the main training parameters (normalization, shape, lattice, map size, initialization, training length, training algorithm and neighborhood function). For each simulation, we extracted the SOM quality measures and the results of the Stuart-Maxwell test of the pre-post contingency table of cluster membership.

Results showed that the default set of options lay at the 2.34, 1.35 and 9.02 percentiles of QE, TE and CE respectively. Figures S1-S3 show differences between the options of training parameters in the map quality. However, the conclusions drawn from the hypothesis tests were not largely affected by the choice of training parameters. All simulations showed a $p < 0.05$ for the Stuart-Maxwell test on the slackline while only 4 simulations (0.23%) showed a $p < 0.05$ for the flamingo test. These results demonstrate the strong robustness of the conclusions with respect to the choice of training parameters.

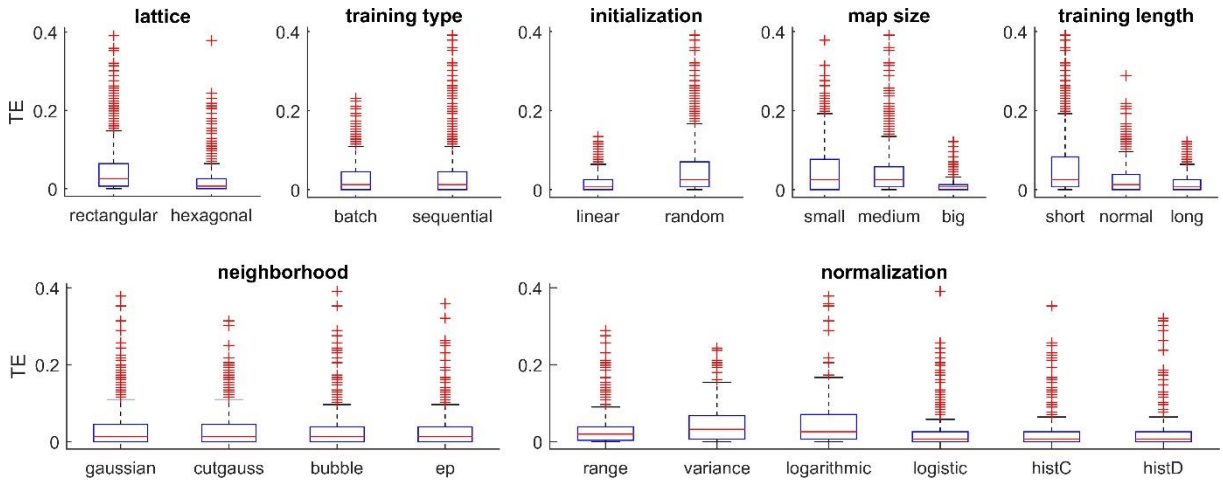

Fig S1: *Topological error for all simulations, shown in boxplots per option of each training parameter.*

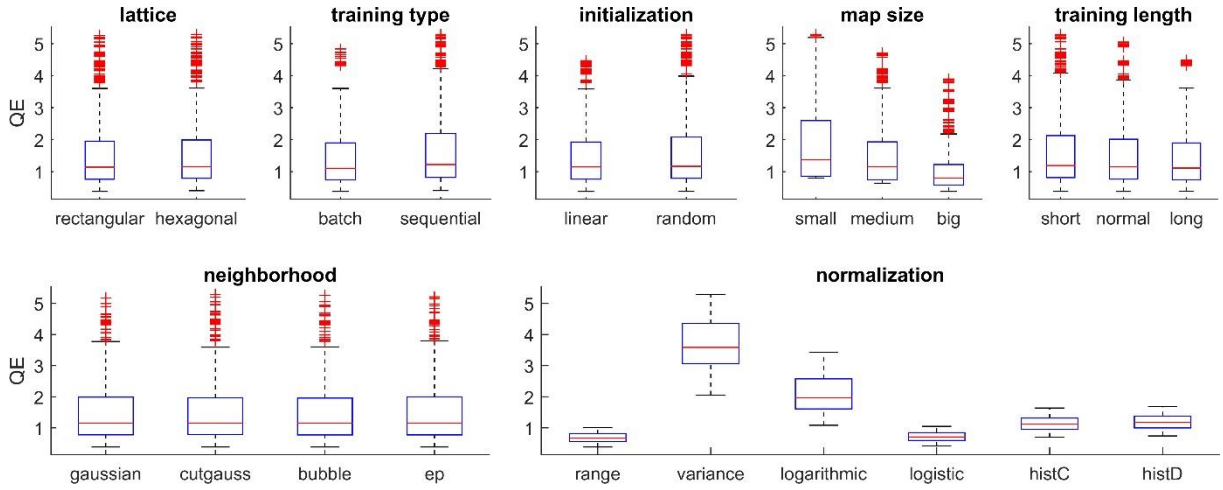

Fig S2: *Quantization error for all simulations, shown in boxplots per option of each training parameter.*

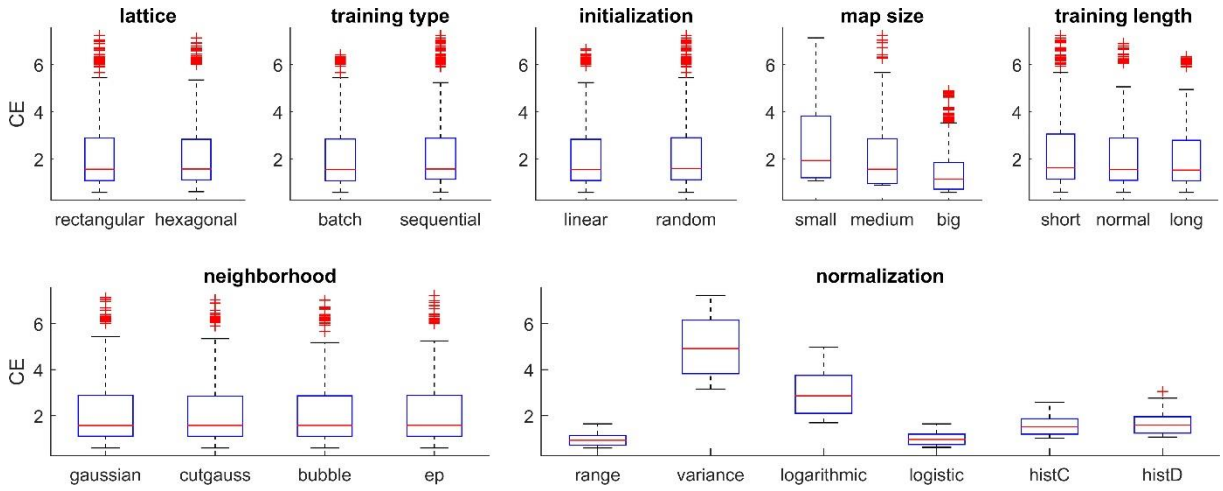

Fig S3: *Combined error for all simulations, shown in boxplots per option of each training parameter.*

References

Kaski S, Lagus K (1996) Comparing self-organizing maps. In: von der Malsburg W, von Seelen JC, Sendhoff B (eds) Proceedings of ICANN96, International Conference in Artificial Neural Networks, Lecture Notes in Computer Science. Springer, Berlin, pp 809–814

Vesanto J, Himberg J, Alhoniemi E, Parhankangas J (2000) SOM Toolbox for Matlab 5.

Supplemental file 2: Table showing the mean ± SD of all 45 variables per condition.

Variables	Flamingo		Slackline	
	Pre test	*Post test*	*Pre test*	*Post test*
RANGE of MOTION				
Ankle pro/supination (°)	17,12 ± 6,54	16,09 ± 4,67	12,77 ± 5,91	16,02 ± 5,75
Ankle plantar/dorsal flexion (°)	5,55 ± 2,17	6,28 ± 2,34	5,52 ± 2,81	6,50 ± 2,42
Knee flexion/extension (°)	11,10 ± 5,39	11,72 ± 5,55	12,46 ± 6,24	13,05 ± 5,48
Hip flexion/extension (°)	17,34 ± 11,43	21,09 ± 12,16	14,96 ± 10,37	20,84 ± 10,75
Hip ab/adduction (°)	24,25 ± 16,52	24,81 ± 12,01	24,43 ± 12,54	30,19 ± 15,15
Pelvis rotation (°)	18,01 ± 10,55	19,05 ± 9,60	16,31 ± 7,00	16,81 ± 7,01
Pelvis lateral tilt (°)	27,46 ± 17,22	28,64 ± 13,72	24,15 ± 10,58	31,57 ± 17,07
Pelvis sagital tilt (°)	9,75 ± 8,33	12,39 ± 7,64	9,74 ± 9,01	12,33 ± 7,43
Trunk rotation (°)	21,59 ± 10,78	25,54 ± 10,01	28,97 ± 12,99	31,69 ± 18,40
Trunk lateral tilt (°)	50,90 ± 25,32	52,93 ± 22,16	55,59 ± 16,54	60,39 ± 23,23
Trunk sagital tilt (°)	16,00 ± 11,70	21,85 ± 19,22	19,00 ± 17,71	23,69 ± 17,07
CoM ant-post (cm)	4,05 ± 1,98	3,78 ± 1,66	3,96 ± 2,12	4,95 ± 1,96
CoM left-right (cm)	4,84 ± 1,72	5,72 ± 2,86	5,96 ± 2,62	5,52 ± 2,42
CoM vertical (cm)	5,58 ± 3,59	7,24 ± 4,46	5,11 ± 3,26	7,25 ± 3,86
VELOCITIES and ACCELERATIONS				
Ankle pro/supination (°/s)	11,40 ± 5,58	11,49 ± 4,41	11,06 ± 4,56	10,37 ± 3,93
Ankle plantar/dorsal flexion (°/s)	3,40 ± 1,17	3,78 ± 1,11	4,97 ± 1,66	4,05 ± 1,08
Knee flexion/extension (°/s)	7,98 ± 3,44	7,69 ± 2,80	11,01 ± 4,65	7,79 ± 2,77
Hip flexion/extension (°/s)	8,22 ± 3,33	8,05 ± 3,95	12,80 ± 5,48	7,96 ± 3,57
Hip ab/adduction (°/s)	416,73 ± 598,87	226,21 ± 335,19	463,27 ± 702,69	309,60 ± 45312,
Pelvis rotation (°/s)	8,48 ± 2,85	8,40 ± 3,56	15,78 ± 7,71	10,06 ± 7,26
Pelvis lateral tilt (°/s)	10,56 ± 6,22	10,15 ± 6,40	15,25 ± 5,11	10,49 ± 5,21
Pelvis sagital tilt (°/s)	4,25 ± 1,92	4,46 ± 2,19	6,97 ± 3,68	4,71 ± 2,23
Trunk rotation (°/s)	8,67 ± 4,12	9,93 ± 4,26	18,27 ± 9,13	10,28 ± 5,88
Trunk lateral tilt (°/s)	20,48 ± 9,56	18,18 ± 8,26	29,13 ± 8,06	18,86 ± 6,87
Trunk sagital tilt (°/s)	5,48 ± 3,27	4,83 ± 2,13	8,23 ± 6,33	5,03 ± 2,99
CoM ant-post (m/s)	1,39 ± 0,51	1,39 ± 0,57	2,07 ± 1,04	1,42 ± 0,49
CoM left-right (m/s)	1,65 ± 0,70	1,55 ± 0,57	3,15 ± 1,13	1,77 ± 0,72
CoM vertical (m/s)	2,16 ± 1,02	1,99 ± 0,93	3,52 ± 2,79	2,26 ± 0,89
Head ant-post (m/s^2)	18,05 ± 6,80	17,03 ± 5,06	29,59 ± 11,40	18,27 ± 6,38
Head left-right (m/s^2)	53,13 ± 23,26	48,87 ± 14,91	90,10 ± 37,09	53,04 ± 27,67
Head vertical (m/s^2)	30,11 ± 15,16	28,65 ± 9,66	51,92 ± 22,21	31,85 ± 13,27
FREQUENCIES				
Ankle pro/supination (Hz)	1,18 ± 0,58	0,96 ± 0,65	1,55 ± 1,08	0,93 ± 0,90
Ankle plantar/dorsal flexion (Hz)	0,95 ± 0,44	0,91 ± 0,56	1,76 ± 1,31	0,99 ± 0,88
Knee flexion/extension (Hz)	1,03 ± 0,48	1,03 ± 0,61	1,91 ± 1,75	0,86 ± 0,69
Hip flexion/extension (Hz)	0,85 ± 0,42	0,69 ± 0,40	2,00 ± 1,88	0,65 ± 0,88
Hip ab/adduction (Hz)	0,63 ± 0,22	0,68 ± 0,50	1,77 ± 1,97	0,60 ± 0,89
Pelvis rotation (Hz)	0,90 ± 0,61	0,79 ± 0,43	1,71 ± 1,43	0,85 ± 0,88
Pelvis lateral tilt (Hz)	0,61 ± 0,21	0,64 ± 0,42	1,31 ± 1,13	0,62 ± 0,89
Pelvis sagital tilt (Hz)	0,78 ± 0,47	0,68 ± 0,42	1,90 ± 1,85	0,84 ± 1,34
Trunk rotation (Hz)	0,81 ± 0,41	0,68 ± 0,38	1,18 ± 0,84	0,64 ± 0,45
Trunk lateral tilt (Hz)	0,56 ± 0,18	0,60 ± 0,43	1,08 ± 0,82	0,46 ± 0,43
Trunk sagital tilt (Hz)	0,60 ± 0,23	0,68 ± 0,55	1,21 ± 0,80	0,67 ± 0,88
CoM ant-post (Hz)	0,62 ± 0,20	0,64 ± 0,45	1,25 ± 1,27	0,59 ± 0,90
CoM left-right (Hz)	0,47 ± 0,21	0,45 ± 0,42	1,11 ± 0,91	0,43 ± 0,91
CoM vertical (Hz)	0,77 ± 0,25	0,61 ± 0,28	1,14 ± 0,53	0,64 ± 0,44

Supplemental file 3: SOM visualization showing the labels of all trials

Labels: Subject initials – FL/SL – pre/post. Thick black lines show the cluster borders. Numbers give the cluster number as refered to in the main manuscript.

Example illustrating the count data: subject SA. For the slackline task, she has three trials that were mapped into cluster 3 at the pre-test, while on the post-test, she has two trials in cluster 4 and one trial in cluster 2. In the slackline contingency table, she thus contributed 3 counts to the cell c_{32} and 6 counts to the cell c_{34}.